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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/650,197	08/26/2003	Robert E. Fields III	S-100,576	6269

35068 7590 12/29/2006

LOS ALAMOS NATIONAL SECURITY, LLC
LOS ALAMOS NATIONAL LABORATORY
PPO. BOX 1663, LC/IP, MS A187
LOS ALAMOS, NM 87545

EXAMINER	
ONEILL, KARIE AMBER	
ART UNIT	**PAPER NUMBER**
1745	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/29/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/650,197	FIELDS ET AL.	
	Examiner	Art Unit	
	Karie O'Neill	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 2, 2006, has been entered. Claims 1 and 6 have been amended.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5-6 and 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwase (US 6,656,618 B2) in view of Barton (US 6,724,194 B1).

With regard to Claims 1 and 3, Iwase discloses in Figure 1, an apparatus for controlling a fuel cell power system having a fuel cell stack (36) with a connected energy storage medium (40), comprising: (a) a voltage monitoring circuit or input-output port (20d) connected to monitor individual voltages from one or more individual fuel cells forming fuel cell stack (column 8 lines 55-58); (b) a regulating circuit (20-CPU) with said individual voltages as input, and outputting a control signal to regulate said fuel cell

stack output voltage about a predetermined setpoint (column 8 lines 41-58); (c) a first DC-DC converter (38) connected to said regulating circuit (20) and said fuel cell stack (36), to receive said control signal and outputting a new voltage corresponding to a maximum power that said fuel cell stack can provide and supplying said new voltage to an output bus (46) and said energy storage medium (column 5 lines 28-38), wherein energy storage medium is a battery (column 7 lines 53-54).

Iwase does not disclose wherein said voltage monitoring circuit measures said individual voltages of said one or more individual fuel cells and monitors whether any of said individual voltages are below an operating point voltage and are in danger of reversal to a negative potential.

Barton discloses in Figures 1 and 2, a cell voltage monitor (15) suitable for measuring the voltage of each pair of fuel cells in the fuel cell stack (1) to determine whether any of the voltages are below an operating point voltage which is measured to a reference voltage supply (3) (column 5 lines 62-67) and are in danger of reversal to a negative potential (column 4 lines 40-47 and lines 52-54). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to use a monitoring circuit to monitor the individual voltages, for below operating point voltages and being in danger of voltage reversal, of the fuel cells of Iwase, because Barton teaches that a low voltage in any fuel cell in the stack can be detected and appropriate action may then be initiated to prevent damage to the rest of the cells or the stack (column 4 lines 55-57).

With regard to Claim 2, Iwase discloses a blocking diode (39) connected between said first DC-DC converter (38) and said output bus (46) to cause electric current to flow only in one direction or to prevent reverse electrical current flow from said output bus into said first DC-DC converter (column 7 lines 50-52).

With regard to Claim 5, Iwase discloses a DC-AC inverter (44) connected between said energy storage medium (40) and said output bus (46) for receiving a variable voltage from said fuel cell power system and providing a constant AC output voltage to said output bus (column 8 lines 15-18).

With regard to Claim 6, Iwase discloses in Figure 2, a method for controlling a fuel cell stack with a connected energy storage medium, comprising: (a) monitoring one or more individual fuel cell voltages within said fuel cell stack with an individual cell voltage monitor (part of the CPU); (b) setting a stack voltage setpoint within a regulator circuit (CPU) for operating said fuel cell stack at a maximum power output (column 9 lines 39-42); (c) modifying said voltage setpoint to a higher voltage which is varied with a variation in flow rate of the gaseous fuel flowing into the fuel cells (column 9 lines 27-29); and (d) controlling a DC-DC converter connected between said fuel cell stack and said energy storage medium with said regulator circuit (CPU) to maintain a regulated voltage output to an output bus corresponding to said maximum power output (column 11 lines 4-7 and step S28).

Iwase does not disclose wherein said voltage monitoring circuit measures said individual voltages of said one or more individual fuel cells and monitors whether any of

said individual voltages are below an operating point voltage or are in danger of reversal to a negative potential.

Barton discloses in Figures 1 and 2, a cell voltage monitor (15) suitable for measuring the voltage of each pair of fuel cells in the fuel cell stack (1) to determine whether any of the voltages are below an operating point voltage which is measured to a reference voltage supply (3) (column 5 lines 62-67) and are in danger of reversal to a negative potential (column 4 lines 40-47 and lines 52-54). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to use a monitoring circuit to monitor the individual voltages, for below operating point voltages and being in danger of voltage reversal, of the fuel cells of Iwase, because Barton teaches that a low voltage in any fuel cell in the stack can be detected and appropriate action may then be initiated to prevent damage to the rest of the cells or the stack (column 4 lines 55-57).

With regard to Claims 9-10, Iwase discloses in steps S24-S46 in Figure 2, the step of monitoring the operation of the cell voltage monitor in the CPU and increasing or decreasing the said stack setpoint voltage when it is determined that the highest energy conversion efficiency is less than zero or greater than zero and the output of electric energy by the fuel cells is in excess or the electric output of the cells is not sufficient and not capable of supplying the power required to the output bus (column 10 lines 4-29).

With regard to Claims 11-12, Iwase discloses monitoring the said regulated voltage output of the DC-DC converter in Figure 2 step S20, and decreasing the voltage output of said DC-DC converter when it is determined that the fuel cell stack is loaded

beyond said maximum power output (column 11 lines 27-31 and steps S24-28) and increasing the voltage output of said DC-DC converter when it is determined that the fuel cell stack is not at maximum power output (column 12 lines 35-49 and steps S42-46).

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwase (US 6,656,618 B2) in view of Barton (US 6,724,194 B1), as applied to Claims 1-3, 5-6 and 9-12 above, and in further view of Rajashekara (US 6,321,145 B1).

Iwase and Barton disclose the apparatus and method for controlling a fuel cell power system in paragraph 3 above, but do not disclose a second DC-DC converter connected between said energy storage medium and said output bus for receiving a variable voltage from said fuel cell power system and providing a fixed DC output voltage to said output bus.

Rajashekara discloses in Figure 3 and column 8 lines 63-65, a second buck/boost converter (62) located between an energy storage medium (60) and an output bus (12) for receiving voltage from the fuel cell system, which powers the system through the output bus. Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to add a second DC-DC converter to the fuel cell power system of Iwase and Barton, because Rajashekara teaches that a second DC-DC converter is needed in order to match the DC electric voltage needed to properly supply the output bus and keep a constant voltage supplied to it (column 9 lines 58-61).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwase (US 6,656,618 B2) in view of Barton (US 6,724,194 B1), as applied to Claims 1-3, 5-6 and 9-12 above, and in further view of Fuglevand (6,497,974 B2).

Iwase and Barton disclose the apparatus and method for controlling a fuel cell power system in paragraph 3 above, but do not disclose the step of monitoring operation of said individual cell voltage monitor, and resetting the voltage setpoint when it is determined that said individual cell voltage monitor is not functioning properly.

Fuglevand discloses in column 13 lines 38-52, error processor circuitry that is coupled in voltage sampling to the output of the individual cells and compares the actual output of the voltage to the desired and set output voltage and makes appropriate adjustments when the voltage is not proper. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention to be able to monitor the individual cell voltage monitor to determine if the voltage monitor of the Iwase and Barton fuel cell system was working properly, because Fuglevand teaches not running the fuel cell system at incorrect voltages and helping to ensure the maximization of fuel cell life expectancy and fuel cell performance (column 13 lines 5-6).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwase (US 6,656,618 B2) in view of Barton (US 6,724,194 B1), as applied to Claims 1-3, 5-6 and 9-12 above, and in further view of Bourilkov et al. (US 2004/0174072 A1).

Iwase and Barton disclose the apparatus and method for controlling a fuel cell power system in paragraph 3 above, but do not disclose turning off the DC-DC converter when it is determined that the fuel cell stack is experiencing low cell voltage that could damage the fuel cell stack.

Bourilkov et al. discloses in paragraph 0044, that the DC-DC converter will stop operating a certain minimum voltage and at that time the activation for regeneration of the fuel cell stack will occur. Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to use the DC-DC converter method step with the fuel cell system of Iwase and Barton, because Bourilkov et al. teaches stopping the flow of voltage to the fuel cell stack so as not to damage the stack and allow the stack to have to regenerate (paragraph 0044).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571) 272-8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill
Examiner
Art Unit 1745

KAO

DAH-WEI YUAN
PRIMARY EXAMINER